

DEPARTMENT OF MECHATRONICS ENGINEERING **COURSE SYLLABUS**

Course Details							
Code				Acad	emic Ye	ear	Semester
MEC317				2	2		Fall
Title				т	Α	L	ECTS
Algorithms and Data Structures 1				2	0	2	6
Language	German						
Level	Undergraduate	ergraduate X Graduate			F	Postgra	duate
Department / Program	Computer Science						
Forms of Teaching and Learning	Face-to-Face, Group Study, Individual Study, programming.						
Course Type	Compulsory		X		Elective		
Objectives	The students have in-depth knowledge of the basic data structures (arrays, lists, trees,) and the basic algorithms (sorting, searching, shortest path algorithms,). In addition, they can estimate the correctness and runtime complexity of algorithms. By working on real world problems, they will learn to use algorithms in different areas to solve complex problems.						
Content	 Complexity analysis (loop invariants, asymptotic notation, runtime estimation, worst and average-case analysis), P / NP complete problems Basics of the design and analysis of algorithms Iterative, recursive and dynamic algorithms Basic data structures (arrays, lists, stacks, queues, search trees, hash tables,) Search and sort algorithms Graphs, data structures for graphs, algorithms on graphs shortest path problem (Dijkstra, Bellman-Ford algorithm) Practice techniques for creating and testing programs and algorithms Realization of algorithms on the computer 						
Prerequisites	None						
Coordinator	DI Dr. Burcu Yıldız						
Lecturer(s)	DI Dr. Burcu Yıldız						
Assistant(s)	-						
Work Placement	None						
Recommended or Required Reading							
Books / Lecture Notes	 Robert Sedgewick and Kevin Wayne. 2011. <i>Algorithms</i> (4th. ed.). Addison-Wesley Professional. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. 2009. <i>Introduction to Algorithms, Third Edition</i> (3rd. ed.). The MIT Press. Goodrich M.T, Tamassia R. Data Structures and Algorithms in Java. Wiley, 2006. 						
Other Sources	 Rıfat Çölkesen. Veri Yapıları ve Algoritmalar. Papatya Yayıncılık, 2014. Markus von Rimscha. Algorithmen kompakt und verständlich. Vieweg+Teubner, 2008. 						
Additional Course Material							

DEPARTMENT OF MECHATRONICS ENGINEERING

	LOURSE	SYLLABUS			
Documents	-				
Assignments	-				
Exams	-				
Course Composition					
Mathematics und Basic	20	%			
Engineering			%		
Engineering Design			%		
Social Sciences			%		
Educational Sciences			%		
Natural Sciences			%		
Health Sciences			%		
Expert Knowledge	80	%			
Assessment					
Activity	Cou	Percentage (%)			
Midterm Exam	1	30			
Quiz					
Assignments	1	10			
Attendance					
Recitations					
Projects					
Final Exam	1	60			
		100			
ECTS Points and Work Load					
Activity	Count	Duration	Work Load (Hours)		
Lectures	14	2	28		
Self-Study	1	66	66		
Assignments	10	4	40		
Presentation / Seminar Preparation					
Midterm Exam	1	3	3		
Recitations					
Laboratory	14	2	28		
Projects					

Total Work Load

ECTS Points (Total Work Load / 28)

168

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Learning Outcomes							
1	Understand da	Understand data structures and their impact on complexity					
2	Understand se	Understand search and sort algorithms					
3	Understand runtime and storage complexity						
4	Independent i	mplementation of	of recursion and	l dynamic prog	ramming		
5	Basic understanding of graphs						
6	Understanding	g and application	of shortest pat	h algorithms			
Weekly Conten	it						
1	1 Overview, motivation & application examples						
2	Complexity analysis, runtime analysis						
3	Arrays, lists, stacks and queues as data structures. Operations on these data structures (insert, search, delete)						
4	Trees as data structures, operations on trees (insert, search, delete, tree traversal)						
5	Types of algorithms: recursive algorithms						
6	Types of algorithms: greedy, divide-and-conquer						
7	Sort in arrays (InsertionSort, BubbleSort) runtime analysis						
8	Sort in arrays (MergeSort, QuickSort) runtime analysis						
9	Midterm Exams						
10	Types of algorithms: backtracking, dynamic programming						
11	Graphs, implementation of graphs, graph traversing						
12	Algorithms on graphs (shortest paths, Dijkstra,)						
13	Algorithms on graphs (shortest paths, Dijkstra,)						
14	14 Sets, maps, tries as data structures						
15	15 Summary						
Contribution of Learning Outcomes to Program Objectives (1-5)							
	P1	P2	P3	P4	P5	P6	P7
1	5	5	4			3	1
2	5	5	4			3	1
3	5	5	4			3	1
4	5	5	4			3	1
5	5	5	3			3	1
6	5	5	3			3	1
Contribution Lev	el	1: Low 2: Low-in	termediate 3: Ir	termediate 4:	High 5: Very High	1	
http://bm.tau.edu.tr/learning-objectives-of-the-program							



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